Articles

Costs of Minimally Invasive Laser Surgery Compared With Transurethral Electrocautery Resection of the Prostate

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We reviewed hospital charges for patients undergoing uncomplicated endoscopic surgical resection for symptomatic bladder outlet obstruction due to benign prostatic hyperplasia over a 1-year period at a single institution. Of 115 patients, 67 underwent transurethral electrocautery resection of the prostate, and 48 underwent endoscopic neodymium:yttrium-aluminum-garnet laser ablation of the prostate under direct vision. Analysis showed a cost differential between these 2 surgical treatments in excess of $2,000, favoring laser prostatectomy (P < .0001) over transurethral electrocautery resection. The single greatest difference between the treatments was the ability to manage all patients receiving laser treatment as outpatients, whereas the mean and median hospital stay after transurethral electrocautery resection was 3.0 days. Taking additional cost variables into account and decreasing the cost of laser delivery systems would further increase this cost differential in favor of laser therapy. The diminished postoperative morbidity associated with laser treatment also promises lower total costs over the long term.

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Transurethral resection of the prostate (TURP) represents a leading health care expense in the United States. It is the most common serious operative procedure done on men in this country and is second only to cataract surgery as the major operation most costly to Medicare.[1] About 400,000 prostatectomies are done each year in the United States, representing an overall expense exceeding $5 billion.[2] This surgical procedure alone constitutes more than a third of the major surgical procedures done by urologists, and the clinical activities associated with it are estimated to absorb nearly a quarter of a practicing urologist's time.[1] With improvements in anesthesia and perioperative care, the mortality for TURP has been reduced to 0.2% over the past three decades, but the procedure itself has changed little in its technical execution, and postoperative morbidity has remained unchanged over the same period at a level of at least 18%.[3]

In recent years, driven by the high cost of TURP—not only in dollars spent but also in physician effort and overall patient morbidity—urologists have sought less expensive and less morbid means of treating the symptoms of bladder outlet obstruction caused by benign prostatic hyperplasia. Among the newer surgical technologies, transurethral endoscopic ablation of the prostate using a neodymium:yttrium-aluminum-garnet (YAG) laser source has now been studied extensively and

applied in a large number of patients with encouraging results.[4-23] This technology appears efficacious in relieving symptoms due to prostatic hyperplasia and has been shown to produce substantially less morbidity than the standard TURP, including but not limited to decreased intraoperative irrigation absorption, better hemostasis, and overall diminished physiologic stress to patients. This relative lack of morbidity has allowed us to move the surgical treatment of benign prostatic hyperplasia to an outpatient, ambulatory, or same-day surgery setting.[14,17] Laser ablation of the prostate has also been shown to decrease total operative time for urologists and patients.[9,10] We examined the effect of these factors on the overall cost of surgical therapy for prostatic hyperplasia.

Patients and Methods

We retrospectively analyzed hospital charges and medical records of patients undergoing transurethral endoscopic surgical treatment at Stanford (California) University Hospital for the relief of bladder outlet obstruction due to benign prostatic hyperplasia during the period from July 1, 1992, through June 30, 1993. Patients undergoing open prostatectomy were excluded from this analysis. Similarly, patients with estimated excess hyperplastic tissue of more than 100 grams treated with laser were excluded because they would nor-

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ABBREVIATIONS USED IN TEXT

SD = standard deviation
TURP = transurethral resection of the prostate
YAG = yttrium-aluminum-garnet

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mally have been treated by open prostatectomy and would not be considered candidates for standard TURP. In addition, patients undergoing concurrent surgical procedures such as inguinal herniorrhaphy at the time of transurethral prostatectomy were excluded from analysis because this affected the total operative time and hospital costs. For the purposes of this study, all TURP procedures were done by four experienced—range, 6 to 25 years in active surgical practice—private urologic practitioners (community urology service) without resident assistance. All laser procedures were performed by a single member (J.N.K.) of the Stanford academic urology faculty (university urology service), both with and without resident assistance.

A total of 115 patients were evaluable for the study period. Of these, 67 underwent standard TURP, and 48 were treated with laser prostatectomy. The mean patient age for TURP was 69.5 years (range, 45 to 89 years) and for laser prostatectomy was 70.0 years (range, 50 to 85 years). The mean estimated excess hyperplastic tissue in patients undergoing laser prostatectomy was 33 grams (range, 5 to 100 grams; standard deviation [SD] ± 21 grams). This compares with a mean resected tissue weight of 24 grams (range, 3 to 90 grams; SD ± 21 grams) in patients undergoing standard TURP. All laser procedures were performed with the Urolase (C. R. Bard, Inc) right-angle laser delivery fiber and a standard neodymium: YAG laser source. The operative technique used for laser prostatectomy has been described previously.[24]

Results

The mean total hospital charge to patients undergoing TURP at Stanford University Hospital during the period of this study was $8,262.06, exclusive of surgeons' and anesthesiologists' fees. No significant difference was found in hospital charges incurred between patients treated with TURP by any of the four urologic practitioners, as shown in Tables 1 and 2. By comparison, the mean total hospital cost for laser prostatectomy was $6,174.44, an average difference of $2,087.62 per patient (Student's t test, $P < .0001$).

TABLE 2.—Statistical Comparison (P Values, Student's t Test) of Total Hospital Costs to Patients Undergoing Transurethral Resection of the Prostate by Each of 4 Private Urologists*

Physician	MD 1	MD 2	MD 3	MD 4
MD 1	--	>.9	>.5	>.7
MD 2	>.9	--	>.4	>.7
MD 3	>.5	>.4	--	>.2
MD 4	>.7	>.7	>.2	--

*No statistical difference is found in hospital costs between practitioners.

A partial breakdown of these costs shows similar operating room charges incurred by both treatment groups (Table 3). These charges routinely included a $539 fee charged by the hospital for the use of the neodymium:YAG laser. The laser treatment group also incurred an additional supply charge ($840) for the laser delivery fiber. All of the patients undergoing laser prostatectomy were managed as outpatients, however, eliminating any hospital room charges (Table 3). The latter averaged $2,262.96 for patients undergoing standard TURP, who were admitted for a mean and median period of 3.0 days, with a range of 1 to 7 inpatient days (Figure 1). This represented the single largest cost differential between the two treatment groups. No patient in either treatment group in this study required hospital readmission following discharge to home.

Discussion

In this study of patients with symptomatic bladder outlet obstruction due to benign prostatic hyperplasia, treated concurrently and in the same institution by either standard TURP or laser prostatectomy, laser treatment resulted in a net reduction of hospital costs exceeding $2,000. If, based on current Medicare fee schedules, professional fees are estimated to be about $1,000 each for the surgeon and the anesthesiologist, then the total cost to a patient of a TURP performed at Stanford Hospital during the period of this study was more than $10,000. Laser prostatectomy achieved a cost savings of more than 20% of this figure.

These figures represent a conservative estimate of the total cost reduction possible with laser prostatectomy. As noted, the Stanford operating room routinely added a charge for laser use. This serves to offset the initial capital equipment cost and ongoing maintenance costs of the laser to the hospital. No similar charge was added for

TABLE 1.—Mean Total Hospital Costs Incurred by Patients Treated With Standard Transurethral Resection of the Prostate by Each of 4 Private Urologists

Physician	Total Hospital Cost, $*
MD 1..........................	8,383.67 ± 961.51
MD 2..........................	8,438.34 ± 736.52
MD 3..........................	7,669.17 ± 555.99
MD 4..........................	8,700.47 ± 666.33

*Mean ± standard error of the mean.

TABLE 3.—Selected Hospital Charges and Total Hospital Costs for Patients Undergoing Standard Transurethral Resection of the Prostate (TURP) and Those Having Laser Prostatectomy*†

Procedure	OR Charges, $	Laser Fiber, $	Hospital Room Cost, $	Total Hospital Cost, $
TURP..........	3,003.27	--	2,262.96	8,262.06
Laser..........	2,971.39	840.00	--	6,174.44

OR = operating room

*P <.0001.
†Mean cost differential, $2,087.62.
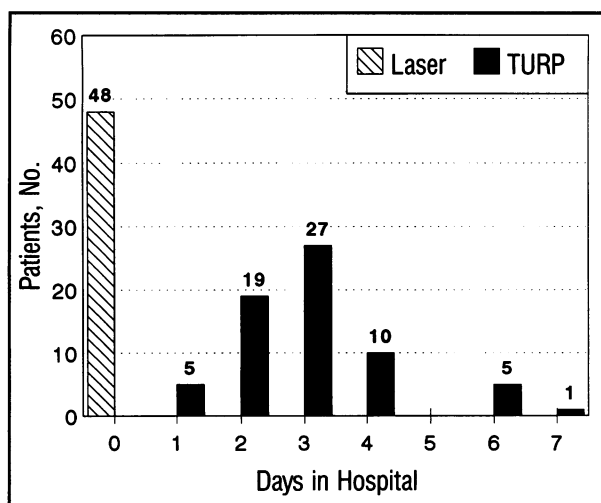
Figure 1.—Distribution of patients by the number of days in hospital required for laser prostatectomy (all outpatient) and for standard transurethral resection of the prostate (TURP) is depicted by bar graph.

the electrosurgical equipment and resectoscopes used for standard TURP. Patients receiving laser treatment were also charged an additional $840 for the price of the disposable laser delivery fiber used to perform laser prostatectomy. Less expensive laser delivery systems are already available on the market, and prices may reach the $400 level by the end of 1995. Reusable laser delivery systems have the potential to cut the cost per case further. A final confounding variable in this analysis is the fact that all patients on the university urology service undergoing laser prostatectomy had preoperative laboratory and radiographic studies done in the hospital, and charges for these were routinely included in their hospital bill. By contrast, most patients undergoing TURP on the community urology service had preoperative studies done at outside facilities, and these were not included as part of their hospital bill. The actual cost of TURP to these patients was, therefore, somewhat higher than the current figures indicate.

Even at the time of this writing, both state and national panels are debating reimbursement for laser prostatectomy and other new surgical approaches to the treatment of benign prostatic hyperplasia. It is possible, and perhaps probable, that physician reimbursement for laser prostatectomy will be set at a lower level than currently provided for TURP. This would, of course, further reduce the total cost of laser prostatectomy relative to TURP, but could be counterproductive if excessively low payment schedules discourage the use of this newer and less costly technology.

A cost that is difficult to quantify is the overall reduction in patient morbidity produced by laser treatment compared with standard electrocautery TURP. Previous studies have documented substantial differences in irrigation fluid absorption, blood loss, and total patient morbidity favoring laser prostatectomy in prospective, randomized trials of these two operative approaches.[9,10]

Although our study did not attempt to examine perioperative complications in any detail, transfusion records were readily accessible for all 115 patients. These showed that 12 of 67 patients (18%) undergoing standard TURP received blood transfusions (a total of 18 units). Whereas the direct cost of transfusing a patient was several hundred dollars, the cost of treating even one case of transfusion-related hepatitis or human immunodeficiency virus infection is logarithmically higher. Furthermore, no dollar figure can be assigned to the psychological stress caused to a patient who fears transfusion and its possible complications as he approaches a surgical procedure. No laser-treated patient in our series required a transfusion, and we have now treated more than 250 patients using this technology without using transfusion, including fully anticoagulated patients who would not have been candidates for standard TURP.[15,16]

Similarly, laser prostatectomy has eliminated the occurrence of complications related to intraoperative irrigation absorption, and we and others have not yet seen a case of iatrogenic urinary incontinence result from laser therapy. This condition occurs in perhaps 2% of patients having standard TURP,[3] and individual cases are remarkably costly in terms of surgical correction or the lifelong use of diapers, appliances, or skilled nursing care—not to mention patient disability, both psychic and physical.

Following laser prostatectomy, patients are able to resume all normal physical activities, including returning to work, as soon as the urethral catheter is removed, usually within the first postoperative week. Nonstrenuous work can even be resumed with the catheter in place on the first postoperative day, if the patient so desires. This is unlike the case with standard electrocautery TURP, where common practice dictates only light activity for as long as four to six weeks postoperatively to lessen the risk of straining and late hemorrhage from the prostatic fossa. Thus, laser prostatectomy can result in additional cost savings with fewer workdays missed and with sustained work productivity through the perioperative period for active patients who are not retired.

A final but important consideration in the estimates of the costs of surgical treatment of benign prostatic hyperplasia are retreatment rates. Preliminary data encompassing 18 to 36 months' postoperative follow-up indicate that laser prostatectomy is similar in retreatment rates to standard TURP over this time span.[8,14,23] Long-term follow-up—five and ten years—is clearly indicated to define exact retreatment rates following laser therapy. Laser prostatectomy does appear to produce a substantially lower incidence of postoperative strictures compared with TURP.[9,10,23] Such strictures, representing postoperative scarring of the bladder neck, urethra, or both, are a major cause of reoperation after TURP.

We are currently entering a new era for health care in the United States where the evaluation of new therapies—both medical and surgical—must include assessing not only safety and efficacy, but also relative cost efficiency. Not all of our scientific advances will meet

this final criterion of cost efficiency. In many cases, we may find it most prudent to settle for less advanced technology where relatively small improvements in patient outcomes provided by the latest surgical device or pharmacologic preparation cannot justify the large jumps in cost of care with which they are sometimes associated. This does not appear to be the case with laser treatment of symptomatic benign prostatic hyperplasia. Already shown to be safer and much less morbid than standard TURP, and with notable therapeutic efficacy demonstrated in numerous studies,[4-23] laser prostatectomy also appears to have the potential to substantially undercut the costs associated with standard surgical therapy for this common condition. Using a relatively conservative estimate of $2,500 savings per patient, if 400,000 prostatectomies are done yearly, then the simple introduction of laser technology could eliminate $1 billion from our annual health care budget.

Acknowledgment

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